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The Särna ring, a circular magnetic anomaly in the county of Dalarna, Sweden

Lutz Kubler (1), Thomas Lundqvist (2), and Jan-Olof Svedlund (3)

(1) Geological Survey of Sweden, Uppsala, Sweden (Lutz.kubler@sgu.se), (2) Täby, Sweden (thomaj@swipnet.se), (3) Uppsala, Sweden (josved@telia.com)

Airborn geophysics, carried out in 2005 by the Geological Survey of Sweden, in a region some kilometres to the north of the small community of Särna in the county of Dalarna, central Sweden, revealed a nearly perfect circular magnetic anomaly between 9 and 11 km in diameter. The geological understanding of the area is based on scarce occurrences of outcrops inside and outside the circular area. Exposed rock on the anomaly itself has not been observed. Thus the cause and nature of the magnetic field anomaly are unknown. The great number of doleritic dikes of different ages surrounding the structure and exposed in numerous outcrops implies that the magnetic ring could be made up of some kind of mafic intrusion.

Some few kilometres to the southwest, the well known alkaline särnaite intrusion (280 Ma), a partly cancrinite-bearing nefeline syenite, is situated. It is surrounded by a circular magnetic anomaly, but also here exposures of the source rock are missing. Only in the northern part of the intrusion the magnetic field data indicate that it is bordered by the so called Särna dolerite($\sim$1270 Ma).

The two ring structures are surrounded by volcanic rocks of rhyolitic composition. These volcanics compose a large window in a cover of a sedimentary rock unit, the “Dala sandstone”. At some exposed contacts between volcanic and sedimentary rocks, layers of conglomerates and breccias with clasts of both volcanic rocks and sandstone occur.

Electromagnetic data from the same area revealed a much more distinct concentric system of low-resistivity zones located more or less concentrically around the two circular magnetic structures.

It is suggested that the described pattern revealed by geophysical and geological observations may be due to an up-doming of the area by the emplacement at depth of mafic rock masses, resulting in cone sheet-like fracture systems which were partly intruded by the (doleritic?) magma.

However, certain geological observations, like some compositional differences between the c. 1 700 Ma volcanics inside respectively outside the large ring, make it possible to interpret the structure as a caldera formation (collapse structure) related to these volcanics. This would explain the wide spread of volcanic rocks around this centre, and does not contradict a later emplacement of doleritic magmas, or magmas related to the younger särnaite, into some of the concentric ring fractures. Only sampling by drilling through the rock formation may give the final answer to the origin of the circular magnetic anomaly and the stratigraphic position of the rocks causing it.